

APPENDIX A
CURRICULUM VITAE OF REID BRENNEN

EDUCATION

Ph.D. Mechanical Engineering Design, *University of California, Berkeley*, December 1993

Major emphasis: Micro-mechanical design.

Minors: Dynamics and Material Science

Thesis: "Large Displacement Electrostatic Microactuators
With Polysilicon Flexure Suspensions"

M.S. Mechanical Engineering, *University of California, Berkeley*, May 1989

Thesis: "Design and Numerical Simulation of a Self-Integrating Accelerometer"

B.S. Mechanical Engineering, Honors *University of California, Berkeley*, December 1987

EXPERIENCE

Hewlett Packard Laboratories/Agilent Laboratories, Palo Alto, CA 10/96 - present
Member Technical Staff

Project engineer for microfluidic engineering concepts, design, fabrication and use, with an emphasis on chemical analysis applications including capillary electrophoresis and other liquid phase analyses.

Jet Propulsion Laboratory, Pasadena, CA 11/93 - 9/96
Member of Technical Staff

Technical lead on implementation of the LIGA micro-fabrication process by consortium of U.S. National Labs and Jet Propulsion Laboratory. Process included X-ray mask fabrication, high aspect ratio X-ray lithography, silicon machining, electroplating.

Technical lead on projects to fabricate high-aspect ratio X-ray collimating grids for an orbiting solar telescope, a miniature mass spectrometer, micro-coils, heat exchangers, and actuators. 8 publications

Implemented parts of the LIGA process at Lawrence Berkeley Laboratory, including X-ray resist preparation, X-ray exposure, resist developing, and electroplating preparation. Collaborated on thick photoresist X-ray mask development. Designed, developed, and implemented new methods of LIGA X-ray exposure. Developed and implemented three X-ray exposure scanners and mask/substrate cooling assemblies. Assembled the 10.3.2 UHV X ray beamline at the Advanced Light Source at Lawrence Berkeley Laboratory. Experimenter-in-charge of beamline 10.3.2. Developed methods and equipment for the developing of thick X-ray resist. Supervised various students and staff at Lawrence Berkeley Laboratory. Technical lead for project to design, develop, and fabricate X-ray grids for a solar X-ray telescope using various fabrication methods,

including LIGA, silicon machining, and optical lithography using thick film resists,. Collaborated on project to fabricate a miniature mass spectrometer. Collaborated with several groups at other institutions on LIGA process development. Worked with industry on several different projects including micro-coils, heat exchangers, and actuators.

Berkeley Sensor & Actuator Center, University of California, Berkeley, CA 1/88 - 11/93
Post-Graduate Researcher

Designed, analyzed, simulated, fabricated, and experimentally tested various microscale large displacement resonating and static electrostatic actuators. Fabricated microstructures in the Berkeley Microfabrication Laboratory.

Post-Graduate Researcher Designed, analyzed, simulated, fabricated, and experimentally tested various microscale structures based both on innovative designs for multiple mode resonant structures and on original concepts for large displacement microstructures. Designed, analyzed, and simulated a microscale self-integrating accelerometer. Fabricated microstructures in the Berkeley Microfabrication Laboratory. Research required proficiency in microfabrication techniques and processes as well as high-level language programming in Fortran, C, and UNIX for analysis and numerical simulation implementations.

Space Sciences Laboratory, University of California, Berkeley, CA 1/91 - 4/91
Design Engineer

Designed, built, and tested the working test model and flight versions of the interface assembly on a fast track basis for a long duration exposure experiment on the Russian Space Station Mir.

Developed concepts to design, build, and test both the working test model and flight versions of the mechanical interface between a long duration exposure experiment and the Russian Space Station Mir. Traveled to the Soviet Union as the consultant for the working test model and again later as consultant and troubleshooter for the flight hardware. Instructed the cosmonaut trainers on installation procedures for the experiment.

Zanderbuilt, Berkeley, CA 4/80 - 12/87
Journeyman Carpenter/Cabinetmaker

Performed all aspects of residential remodeling and construction. Directed carpenter crews in both carpentry and cabinetmaking. Installed residential plumbing and electrical systems. Performed general carpentry, cabinetry, plumbing, and electrical work.

New Orleans Ballet, New Orleans, LA 1/77 - 12/79
Dancer and Production Assistant

Performed classical and modern ballets. Taught ballet classes. Arranged 60 educational performances in grammar schools per year. Head stagehand for tour performances.

MEMBERSHIPS

Member of American Society of Mechanical Engineers (ASME).
Member of Institute of Electrical and Electronics Engineers (IEEE).
Member of International Society for Optical Engineering (SPIE).

MISCELLANEOUS

Nominated and chosen to attend the National Academy of Engineering Fourth Annual Symposium on Frontiers of Engineering September 1998.
Chosen to attend the National Academy of Engineering Second German-American Symposium on Frontiers of Engineering April 1999.

INTERESTS

UC Ballroom Dancers Member: 1/89 - present, Vice-President 5/91 - 5/92 Organized weekly lessons for 150 people; planned two annual balls for 300 people; taught various ballroom dances.
UC Ballroom Dance Team: 6/90 - 6/92, Team Captain and Coordinator, 8/90 - 12/91. Initiated and organized 5 fundraising events. Organized trip for 20 people to England for intercollegiate dance competition. Organized numerous dance demonstrations.

Represented the United States at the 1996 World Amateur Ten Dance Championships in Wettingen, Switzerland. United States National Champion in American Smooth Ballroom in 1997 and 1999. 1999 United States National Finalist in International Standard Ballroom.
Science fiction literature, building furniture.

PUBLICATIONS

Reid A. Brennen and Dean V. Wiberg, "Making Au Grids on Si by Optical Lithography and Etching", NASA Tech Briefs, V.21, No7, p. 76, July, 1997.

Reid A. Brennen, et al., "Fabrication of Collimating Grids for an X-ray Solar Telescope Using LIGA Methods," Microsystem Technologies, 1997 V. 3, No. 3, pp. 91-96, May 1997.

P. Buford Price, Andrew J. Westphal, Reid A. Brennen, et al., "Joint American-Russian Experiment, Trek," Advances In Space Research, 1995, V15, N6, Pp. 3-4.

P. Buford Price, Andrew J. Westphal, Reid A. Brennen, Robert D Wilkes, Semyonov Y P; Gorshkov LA; Antonov VV; Baryshnikov GK; Shvets NI; Tsigankov OS; Afanasyev VG; Akimov VV; Rodin VG, "Joint American-Russian Experiment, TREK," Advances In Space Research, 1995, V15, N6, Pp. 3-4.

Chantal Khan-Malek, K. Jackson, R. A. Brennen, et al, "Deep Etch X-Ray Lithography At The Advanced Light Source – First Results", Journal Of Vacuum Science & Technology B, 1994 Nov-Dec, V12, N6, pp. 4009-4012.

Michael T. Ching, Reid A. Brennen, and Richard M. White, "Microfabricated Optical Chopper", Optical Engineering, V. 33, No. 11, pp. 3634-3642, November 1994.

P.B. Price, V. G. Afanasyev, V.V. Akimov, G.K. Baryshnikov, R.A. Brennen, L.A. Gorshkov, D.M. Lowder, V.G. Rodin, N.I. Shvets, O.S. Tsigankov, A.J. Westphal, and R.D. Wilkes, "TREK: A Cosmic Ray Experiment on the Russian Space Station Mir", Astrophysics and Space Science, Nov. 1992, V. 197, pp. 121-143.

CONFERENCE PRESENTATIONS

Reid A. Brennen, Michael H. Hecht, Dean V. Wiberg, Steve J. Manion, William D. Bonivert and Jill M. Hraby, Marcus L. Scholz, Timothy D. Stowe, Tom W. Kenny, Keith H. Jackson, Chantal Khan Malek, "Fabricating sub-collimating grids for an X-ray solar imaging spectrometer using LIGA techniques," Proceedings SPIE: Microlithography and Metrology in Micromachining, Austin, 23-24 October 1995, pp. 214-225, 1995.

Reid A. Brennen, Michael H. Hecht, Dean V. Wiberg, Steve J. Manion, William D. Bonivert and Jill M. Hraby, Kristofer S. Pister, Ezekiel Kruglick, "Fine pitch grids for an X-ray solar imaging spectrometer fabricated by optical lithography and XeF₂ etching," Proceedings SPIE: Microlithography and Metrology in Micromachining, Austin, 23-24 October 1995, pp. 226-235, 1995.

William D. Bonivert, Jill M. Hraby, John T. Hachman, Chantal Khan-Malek, Keith H. Jackson, Reid A. Brennen, Michael H. Hecht, Dean Wiberg, "Electroplating for LIGA processing," Proceedings of the Fourth International Symposium on Magnetic Materials, Processes, and Devices. Applications to Storage and Microelectromechanical Systems (MEMS), 9-12 Oct. 1995, Chicago, IL, USA p.397-403.

Reid A. Brennen, Michael H. Hecht, Dean V. Wiberg, Steve J. Manion, William D. Bonivert, Jill M. Hraby, "LIGA And Thick Film Lithography for Thick Structures," Digest 28th Annual SCCAVS Symposium, Micromachining Workshop II, Technology and Applications, Anaheim, Sept. 27-28, 1995.

Reid A. Brennen, Michael H. Hecht, Dean V. Wiberg, Steve J. Manion, William D. Bonivert and Jill M. Hraby, Marcus L. Scholz, Timothy D. Stowe, Tom W. Kenny, Keith H. Jackson, Chantal Khan Malek, "Fabrication of Collimating Grids for an X-ray Solar Telescope Using LIGA Methods," presented at the High Aspect Ratio Microstructure Technology Conference (HARMST '95), Karlsruhe, Germany, July 3-5, 1995.

Michael T. Ching, Reid A. Brennen, and Richard M. White, "Microfabricated Optical Chopper", Proc. SPIE 1993 International Symposium on Optical Applied Science and Engineering, San Diego, CA, 11-16 July, 1993, v 1992, pp. 40-46.

Reid A. Brennen and Albert P. Pisano, "Multiple Mode Micro-Mechanical Resonators", Proceedings: IEEE Micro Electro Mechanical Systems, Napa, California, February 11- 14, 1990.

Reid A. Brennen, Martin G. Lim, and Albert P. Pisano, "Large Displacement Linear Actuator", Proceedings: IEEE Solid-State Sensor and Actuator Workshop, Hilton Head Island, SC, June 4-7, 1990.

INVITED PRESENTATIONS

Reid A. Brennen, "Methods and issues in the fabrication of microanalysis devices", invited presentation at the Symposium on Advances in Analytical Biotechnology, sponsored by the Yale Engineering Department and Hewlett-Packard, Yale University, April 24, 1997.